semiconductor comprising a GaAs substrate, a buffer layer on said GaAs substrate and an epitaxial crystal layer on said buffer layer, said layers being formed by an epitaxial crystal growth method, wherein said buffer layer and said epitaxial crystal layer on said buffer layer are 3-5 group compound semiconductors each independently represented by the general formula $In_xGa_yAl_zAs$ (wherein, $0 \leqq x \leqq 1$, $0 \leqq y \leqq 1$, $0 \leqq z \leqq 1$, $x+y+z=1$), and the dislocation density in said epitaxial crystal layer on the buffer layer is 1/3 or less of the dislocation density in said GaAs substrate.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a sectional view showing the structure of one embodiment of the 3-5 group compound semiconductor of the present invention.

Fig. 2 is a sectional view showing the structure of Comparative Example 1, a 3-5 group compound semiconductor having no buffer layer.

Figure 3 is a sectional view of the structure of Referential Example 1.

The denotations used in the Figures are as follows.

1: Thin film crystal wafer

2: GaAs substrate

3: Buffer layer

4: Optical device layer

7,13: i-AlGaAs layer

8,12: n-AlGaAs layer

9,11: i-AlGaAs layer

10: i-InGaAs layer

31: $Al_{0.2}Ga_{0.8}As$ layer

32: GaAs layer

41: Clad layer ($Al_{0.4}Ga_{0.6}As$ layer)

42: Active layer ($Al_{0.15}Ga_{0.85}As$ layer)

43: Clad layer ($Al_{0.4}Ga_{0.6}As$ layer)

44: Contact layer

DETAILED DESCRIPTION OF THE INVENTION

The present invention will be explained with referring to the drawings.

Fig. 1 is a sectional view showing one embodiment of an optical device according to the invention. The thin film crystal wafer 1 is used for producing a semiconductor light emitting element, and formed by sequentially growing a plurality of epitaxial crystal layers on a semi-insulating GaAs substrate 2 using an Organic metal vapor phase epitaxy (hereafter, referred to as OMVPE) method.

The buffer layer 3 is grown by allowing a 3-5 group compound semiconductor represented by the general formula $In_xGa_yAl_zAs$ (wherein, $0\leqq x\leqq 1$, $0\leqq y\leqq 1$, $0\leqq z\leqq 1$, $x+y+z=1$) on a GaAs substrate using an OMVPE method. Here, two kinds of layers, $Al_{0.2}Ga_{0.8}As$ layer 31 and GaAs layer 32 each having a thickness of 10 nm

are grown twice, and by this, the buffer layer 3 is endowed with a superlattice structure.

In this embodiment, a buffer layer 3 which consist of superlattice structure is grown on a GaAs substrate 2, and a optical device layer 4 having a double hetero structure is grown on the buffer layer 3, and by this constitution, propagation of dislocation from the GaAs substrate 2 into the optical device layer 4 is suppressed, and the dislocation density in the optical device layer 4 is controlled to a level sufficiently smaller than the dislocation density in the GaAs substrate 2.

The optical device layer 4 has double hetero structure composed of a clad layer ($Al_{0.4}Ga_{0.6}As$ layer) 41, active layer ($Al_{0.15}Ga_{0.85}As$ layer) 42 and a clad layer ($Al_{0.4}Ga_{0.6}As$ layer) 43, and a contact layer 44 is formed on the uppermost part.

The buffer layer is composed of two or more kinds of epitaxial crystal layers having different compositions, however, the crystal layers may have three or more compositions. The composition of a layer constituting the buffer layer 3 can be appropriately selected from those represented by the general formula $In_xGa_yAl_zAs$ (wherein, $0 \leqq x \leqq 1$, $0 \leqq y \leqq 1$, $0 \leqq z \leqq 1$, $x+y+z=1$), and as exemplified in Fig. 1, a combination of two kinds of compositions, $Ga_{1-z}Al_zAs$ ($0<z \leqq 1$) and GaAs, is preferable. In the case of a combination of two kinds of compositions, $Ga_{1-z}Al_zAs$ and GaAs, it is particularly preferable that z is 0.01 or more and 0.4 or less for effectively suppressing propagation of